The Power of Environment--
Nurture Versus
Nature

The Third
of a Series of Monographs
on the Improvement of
the Human Plant

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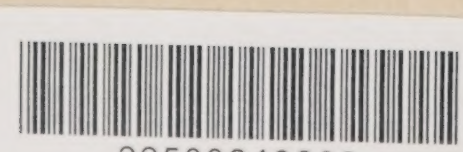
FOREWORD

Heredity is more of a factor in human life than in plant life—more of a menace—more of a hope.

And nothing in the world of living things responds so quickly to new environments as the human mind—child and adult.

The great value of Luther Burbank's work lies in blazing the path of the application of the forces of heredity and environment to the improvement of the human plant—to the production of better races, better nations, better communities, better families, better individuals.

Having completed the classification of Mr. Burbank's Records as applied to plant life, The Luther Burbank Society now proceeds to the larger task of interpreting the forces of heredity and environment toward the betterment of the human plant through a series of monographs, the titles of which are given on the last page, the third of the series appearing herewith.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THE POWER OF ENVIRONMENT -- NURTURE VERSUS NATURE

REPORTS have recently come from New Zealand that tell a remarkable story about the Monterey pine. This tree is indigenous to California. It grows in very restricted regions, and the comparatively few individual trees that are now in existence are supposed to be reminiscent of a remote prehistoric flora. Indeed, the chief interest of the tree hitherto has been the fact that it is found in so restricted an area, and in such small numbers.

But now word comes from New Zealand that this tree has proved to have very remarkable qualities when grown in that country. Some one made the experiment of transporting the Monterey pine to New Zealand a good many years ago, and this change of environment appears to have had a most extraordinary effect.

Whereas the Monterey pine in its native country is practically valueless from an economic standpoint, it proves so remarkable a producer of wood in its new home that it has there received the name "The Wonderful Tree".

Reports tell us that the Monterey pine in this new habitat exceeds all other trees in rapidity of growth, and produces an amount of valuable lumber that is quite without precedent.

No species of pine in America produces lumber at a rate at all comparable to the records that come to us from New Zealand, telling of the extraordinary productivity of the Monterey pine, which, in its native climate, is of such slow growth and produces timber of such poor quality that it is not usually listed among timber-producing trees of economic value.

Now it is obvious that the transplantation of the Monterey pine from California to New Zealand can in no wise have effected the hereditary tendencies of the tree. Whatever capacities for growth and timber-production are revealed by the tree in New Zealand must have existed as potential qualities in the seed that was taken to New Zealand from California. The change has not been brought about from hybridization or by selective breeding.

It is merely that a new environment—new

soil, different climate—has taken a hand in the development of the submerged hereditary factors; and under these new influences the tree has been made to reveal possibilities that were hitherto unsuspected.

So the case of the Monterey pine affords a very striking demonstration of the influence of environment in bringing out unsuspected hereditary tendencies. It furnishes an object lesson in the power of nurture to supplement—and even, on occasion, seemingly to supplant—the power of nature.

An Immigrant Rhubarb

But this very striking demonstration of the modifications in the life history of an organism that may be brought about through changed environment is by no means without precedent.

Something quite comparable has been observed, for example, when the migration has been effected in the opposite direction, the plant being brought from the southern hemisphere to our own northern latitudes.

The case of the eucalyptus tree, which takes on extraordinary capacities of growth in California, is perhaps not to be too greatly emphasized because this tree is also a rapid grower in its native Australian soil. But there are other plants that seem to reveal new possibilities, in particular

when brought to California from the southern hemisphere.

As a typical instance, we may recall Mr. Burbank's Winter Rhubarb. This plant, when Mr. Burbank first imported it from Australia, had a stalk scarcely larger than a lead pencil. The sole value of the plant from an economic standpoint, and the thing that gave it chief interest for Mr. Burbank, was the fact that it had the habit of putting forth stalks in cold weather.

Lower temperature appeared to have the effect of stimulating it, just as high temperatures stimulate most other vegetables.

Mr. Burbank saw in this peculiar habit the possibility of producing a valuable market vegetable that would mature at times when the ordinary pie-plant is dormant. The expectation was verified. Under the changed environmental conditions of California, the winter rhubarb developed wonderfully, without hybridization, until its stalk was many times larger than the original plant from the antipodes. Meantime it retained its habit of putting forth stalks most abundantly during the period of cold weather.

But of course the winter season in California corresponds with the summer in Australia. So in putting forth its stalks in cold weather at Santa Rosa the plant was modifying its habit radically,

as tested by the calendar. That is to say, it now puts forth its stalks in response to the stimulus of cold weather from November to January, instead of from June to August.

Here, then, was a case in which changed conditions of the environment, as marked by the most radical shift of seasons, sufficed to transpose the time of bearing of the plant, twisting it an entire half year out of reckoning.

But meantime the hereditary clockwork mechanism within the cells of the plant, through which its time of development had been adjusted for the months of June, July, and August, still maintained its force; so the plant, thanks to this inherent impulse—and now operating in defiance of environing conditions—continued to put forth its stalks abundantly at its accustomed time, which now, under the changed conditions, coincides with the summer season.

The net result of these two sets of impulses was that the plant continued to be a "winter rhubarb", yet was now a "summer rhubarb" as well.

And by selecting for a few generations among the plants that showed greatest tendency to prolong the seasons, Mr. Burbank was able to merge winter bearing and summer bearing, bridging the gaps of spring and autumn, until his perfected plant, while he still designated it as a "winter rhu-

barb" was in reality an all-the-year bearer.

Meantime by further selection, aided now by hybridization, it was found possible, thanks largely to the aid of the new environment, to stimulate the plant to such unwonted vigor of growth that the descendant of a plant which came to California with a pencil-sized stalk now produced a stalk comparable rather to a broom-handle, lifting its leaves several feet into the air, and fully meriting the name of Giant Winter Rhubarb.

Environment Versus Heredity

Here again, obviously, we are given a striking illustration of the power of environment to bring out concealed hereditary potentialities. We dare not suggest that environment has introduced new traits that did not exist in the hereditary mechanism of the plant. To suggest this would be to imply that environment may transform an organism in a single generation in a way so radical as to bid defiance to specific bounds; making the sequence of evolution a haphazard performance which we cannot believe compatible with the orderly progress of nature.

We are bound to believe, then, that when we see a plant transformed as to its tangible properties in a single generation, or in a few generations, through the influence of changed environment,

we are witnessing the bringing out of suppressed tendencies, the realization of submerged potentialities, rather than the implantation and development of really new traits.

Making the interpretation specific, we must believe that the Monterey pine, which now in California is a tree of stunted growth, had ancestors that were rapid-growing mammoth trees. Through unfavorable conditions—the result, perhaps, of a glacial epoch—the tree gradually modified its habits of growth and perhaps preserved its life through such modification; but the hereditary factors for gigantic growth still existed in its germplasm, and awaited only a favorable opportunity to make themselves again manifest. The opportunity came when some chance seeds of the tree were transported to New Zealand, where it chanced that the conditions of soil and climate were such as to favor these long-submerged hereditary factors, giving them opportunity to prove their existence, and their latent potentialities for development.

Similarly the small winter rhubarb, with its pencil-like stalks, as Mr. Burbank found it in Australia, must be regarded as the dwarfed descendant of some tropical plant of the elder day, which had been forced to modify its manner of growth to meet altered conditions of climate; but which

retained in its germ-plasm, even as the Monterey pine retained, the factors for relatively gigantic growth, biding their time and ready to make response to altered conditions of nurture.

Their opportunity came when seeds of the plant were brought from the antipodes to California, just as the opportunity of the submerged factors of the Monterey pine was found when the migration was made in the opposite direction.

An Example from the Animal World

Were any one disposed to doubt the validity of this interpretation; to question whether environment has in reality such wonderful capacity to alter the seeming mandates of heredity, evidence in substantiation may be found in quite different fields.

Take, for example, the very familiar case of the worker bee. This insect, as is well known, is an immature and sterile female. Under normal conditions in the hive, there are thousands of eggs, each like all the others, and each destined to develop into a sterile worker.

But on occasion the mature workers in the hive enlarge the cell in which one of these worker eggs is deposited, and feed the larva which hatches from it with an unusual quantity of food of exceptional richness. And the individual larva thus singled out for exceptional nurture grows and de-

velops at a rate disproportionate to that of its fellows, and ultimately matures and becomes a fertile female, which, in the terminology of the apiary is designated a queen.

This mature individual presently goes forth from the hive with a band of followers, and establishes a new colony. She in turn deposits eggs and becomes the mother of another swarm of drones and workers.

Yet nothing is more certain than that the hereditary potentialities of the egg which thus was transformed into a queen bee were in no wise different from the potentialities of the thousands of other eggs about it that developed only into sterile workers. Nurture alone determined the transformation. In this case it was purely a matter of food. There was no climatic change invoked or needed. Feeding alone sufficed to bring about a final development of the reproductive organs that was denied all the other larvae of the colony.

This case of the bee is so familiar that its wonderful significance is often overlooked.

Taken by itself, it suffices to illustrate the overmastering power of nurture to decide among the conflicting hereditary tendencies that lie dormant in the germ cell.

Lest the case seem to prove too much, however, let us not forget that it is only the eggs of the

worker that through such treatment can be developed into queens. There are also in the normal hive other eggs, produced parthenogenetically, which will develop into male or drone bees, and which can by no possibilities of altered nutrition be transformed into workers or queens, any more than the worker eggs could be made to develop into drones.

But this illustration, after all, serves only to give recognition to the fundamental fact that heredity, in the last analysis, puts certain definite limitations on environmental interference.

No conceivable environing conditions can be expected, in the nature of the case, to bring out potentialities that do not exist. A dwarfed Monterey pine may be transformed through altered nurture into a mammoth pine; a dwarfed rhubarb into a giant rhubarb; a worker bee into a queen bee. But no conceivable modification of nurture could transform the Monterey pine into a rhubarb of any sort, or the rhubarb into a pine, or either pine or rhubarb into a bee.

To suggest such transformation would be grotesque. Yet these extreme cases are perhaps worth citing to emphasize the fact that when we speak of the power of nurture over nature—as applied to any given individual—we refer only to a power of selection between divergent hereditary

tendencies.

The pine has become a pine through endless generations of development; the rhubarb has become a rhubarb, and the bee has become a bee, through the same slow process of evolution.

Each of these organisms, and every other specific organism of all the myriads, has its own congeries of hereditary factors, and by no conceivable influence can these be suddenly transformed.

What has been developed through the slow process of the ages can be modified through a similar slow process of future ages. Yet within each organism, in virtue of the slow development and modification through the past ages, there are stored up multitudes of hereditary factors that are more or less in antagonism, only one or another series of which can be made manifest in a given generation. And the power of environment is exercised in selecting between or among these conflicting factors.

Nurture could not determine that the Monterey pine should cease to be a pine, but it could determine whether it should be a dwarf or a giant. Nurture could transform a worker into a queen—but not into a drone.

The illustrations from the vegetable and animal worlds have been used to make the case tangible. Let us now turn attention to the human

organism, and study the application of this principle to the development of the human child.

Tendencies Versus Tangible Traits

At the very outset, when we consider the hereditary possibilities of any given child, we are confronted by the fact that the child has two parents, and these parents are not precisely like one another.

It follows that the offspring must be either identical with one parent and unlike the other, or else identical with neither. Experience proves that the offspring always combines in some measure the qualities of both parents; hence, that it never is precisely like either of them. What, then, becomes of the fundamental principle of heredity that "like begets like"? It appears that like does *not* beget like in the sense of identity; and if "like" is only meant to convey a sense of general similarity, it is altogether too vague a principle to have practical utility.

In point of fact, however, no such vagueness exists. The seeming obscurity results partly from the complexity of the conditions and partly from misapprehension of terms. The explanation is found in the fact that heredity implies not so much the transmission of conditions as of tendencies.

Speaking loosely, we often say that consumption, insanity and heart disease are hereditary.

Strictly speaking, the statement is never true. An inherent weakness or susceptibility of lungs, brain, or heart—a tendency towards disease of these organs—may be transmitted, but not the diseases themselves. And so of other conditions. The word tendencies is our open sesame. Two parents having qualities unlike and often mutually exclusive cannot transmit these qualities to their common offspring; but they can transmit all their tendencies to that offspring, even though these tendencies be antagonistic.

An organism cannot *be* two things at once, but it may *tend* to be many different things; antagonistic tendencies within it constantly struggling for the mastery. And aided by external conditions, the tendencies at one time subordinate may at another time become dominant. Failing of such favorable conditions, tendencies may keep up an unequal and seemingly ineffectual struggle throughout the lifetime of an individual, without once making themselves manifest, and yet be transmitted to the offspring with such potential force as there to become operative.

To revert to an illustration presented in an earlier monograph: If one parent has black eyes, the other blue, it is evident that both cannot transmit the color of the eyes to their child. But one may transmit a tendency to black eyes, the other a

tendency to blue, and according as one tendency or the other proves the stronger, the child will have black or blue eyes. Suppose the black-eye tendency prevails for the moment—that is, for that individual. The blue-eye tendency is not eliminated; though dormant for that generation, it may reassert itself so strongly that a child of the next generation will have blue eyes though both its parents have black eyes.

Nor is this all. A tendency may remain dormant, and perhaps unsuspected, not merely for one but sometimes for many generations, becoming at last manifest again in a remote descendant. And this is as true of mental and moral tendencies as of physical.

Here, obviously, we are using the word "tendencies" as practically a synonym of what, from another point of view, we have heretofore spoken of as hereditary "factors." For the moment, we may advantageously hold to this more familiar terminology.

Mixed Human Heredities

Manifestly, then, we shall greatly err if we attempt sweeping estimates of a child's hereditary tendencies from a story of its parents alone.

Nor will it suffice to turn to its grandparents, or even great-grandparents. Atavism assuredly reaches far back of these. But if we invoke a re-

moter ancestry, we shall be dumfounded at the response. Behold them: There were eight great-grandparents; sixteen great-great-grandparents; thirty-two individuals in the generation before that; then 64, 128, 256. We have reached back only to the time of the Pilgrim fathers.

And still they accumulate, these unavoidable ancestors. In the tenth generation they number a thousand, omitting an unimportant dozen or two for the sake of round numbers; in the twentieth generation they are an army of a million. And this is going back only to the twelfth or thirteenth century. One need go but little further and the seemingly unassailable mathematicals will name him an ancestry co-extensive with the entire population of the globe.

Thus are we all proven brothers in fact as well as name. Thus is the antiquarian justified who had traced his ancestry down to the beginning of the seventeenth century, but there lost it; in truth he can scarcely have gone amiss up to that time. Seventeenth, eighteenth, and nineteenth century genealogies are for parvenus.

And behind the jest lie sober realities of the most far-reaching import. Admitting that when examined critically our computation is somewhat shorn of its astounding proportions by marriage of consanguinity, the fact remains, beyond all lev-

ity, that every human being, high or low, has had within recent times a multitude of ancestors in direct line of descent. Marriages of consanguinity being, perhaps, most frequent in circles of royalty, probably the persons who have the fewest ancestors, and of whom, therefore, as we shall see presently, we should expect the least, are kings and their kith.

And yet the aristocrat is wont to look down upon the plebeian because he has no ancestors!

He means, of course, that the plebeian does not know the *names* of his ancestors. But what does he knowof his own? Sir John Jones boasts loudly of his lineage because he knows the names of his little line of Jones ancestors for, say, ten generations back. He holds in contempt poor Smith who cannot bring documentary evidence that he had a great-great-grandfather.

But has Jones at his tongue's end the records of all of the other fifteen of his own ancestors of that fourth generation whose names were *not* Jones? I venture not. But even if he had, what does he know of that boasted tenth generation? Why, that *one* member was named Jones. But what of the 1,023 other individuals who make up the remainder of the phalanx? The ancient Jones may have been a very great man indeed, but he represents less than one-tenth of one per cent. of

the present Sir John's ancestors of that tenth generation.

Fortunate it is for Sir John's peace of mind that he does not know the others, for it is many chances to one they were a motley crew, scattered in all parts of the globe. Not improbably, there were a few Turks and Arabs, and a Negro or two in the company, and it is not at all unlikely that a few score of them were vassals or slaves to some of poor Smith's illustrious but now forgotten ancestors of that same generation.

But whether kings or vassals matters not for our purposes. It is only important to recall that these multitudinous ancestors existed. And there they surely are, ready to be summoned at a moment's notice by the simplest computation.

Making fullest concessions to consanguineous marriages—say by reducing the number one-half—there still remain more than one thousand shades to answer the roll-call of each and every individual's ancestors within ten generations past.

And the principle of atavism is at hand to prove that any particular tendency to any one of these ancestors may crop out unexpectedly after being long suppressed; nay, more, that all the multitudinous tendencies of all these ancestors may be represented—though combined and modified—in

the personality of any particular Smith or Jones or X. Y. or Z of today.

An awful thought, is it not? What wonder that we poor conglomerate mortals are torn by doubts and uncertainties, and contradictory aspirations and conflicting passions? What wonder that consistency is rarest of jewels? The wonder is rather that we can manage to spin any continuous or rational thread of life at all out of such a tangle of unmiscible tendencies. "Like begets like" has ceased to be the simple principle that it seemed.

Why are We Not All Alike?

It appears, then, to use a graphic illustration, that every individual represents the apex of an inverted pyramid of descent, whose base, extending back into history, at some point coincides with the base of a sectional plane of the ancestral pyramid of every other individual of his race.

Why, then, since the same principle has applied to all, are the apices not all identical?

How has the principle "like begets like," applied to a common ancestry, produced such a diversity of descendants?

Heredity, unaided, can give but one answer to this question. It is because the elements of this conglomerate ancestry have not been mixed equally.

There are two ways in which this unequal blending may come about: (1) Through marriages in different degrees of consanquinity, restricting the number of ancestors; (2) Through the influence of Mendelian heredity, according to which, as we have seen, different assortments of hereditary factors may be transmitted to various members of the same fraternity.

At first sight, it is perhaps not apparent why marriages in close degrees of consanguinity should be of especial significance in this connection. But a moment's reflection will make this plain. A consanguineous union greatly restricts the variety of tendencies of the descendants. A person whose parents are cousins, for example, has only six great grandparents, instead of the normal number of eight; and thus, to carry the computation on farther than that generation, his aggregate tendencies are restricted in diversity by one-fourth—in itself a serious matter. Again, certain of these restricted tendencies may be accentuated in a way that may be yet more serious. These are the tendencies of two great-grandparents in whom both lines of descent meet, and who therefore count as four persons in reckoning the child's inherited possibilities.

The offspring of cousins may therefore be theoretically expected to have (1) less than the

average diversity of tendencies, and (2) an abnormal instability of tendencies, due to the accentuation of certain groups. And here practical observation fully sustains theory. It is by the application of these principles that all the specialized races of domestic animals have been so rapidly developed.

The influence of Mendelian heredity might be described, for the present purpose, in closely similar terms. Through this influence, as we have seen, the factors for various qualities in the organism may be so distributed that some of the offspring are entirely without certain of the tendencies of their parents. Reverting again to our familiar illustration, it will be recalled that the offspring of blue-eyed parents all have blue eyes, with no tendency to blackness, even though one of their grandparents may have had black eyes.

Stated in Mendelian terms, this implies that blue eyes are recessive; it being observed that recessive qualities, once they reappear, breed true.

On the other hand, a person with blue eyes may have a brother or sister with black eyes, representing a strain in which there is no tendency whatever to blue eyes. So two different strains, as regards eye color, may be developed from individuals of the same fraternity.

And what is true of eye color is true also of a

considerable number of other traits, including, as we have seen, feeblemindedness, and susceptibility to certain diseases, such as tuberculosis.

It is obvious, then, that the laws of heredity as now understood, suffice to explain wide divergencies among the descendants of any given pair of parents; the critical and determining factor being the particular combinations in which the various offspring of successive generations are mated.

The Origin of the Variations

In all this, it is clear we have to do with the presence of divergent and contradictory traits in organisms of the same species.

But as all the organisms of any species are believed to have been evolved from a pair of common ancestors, differing in many ways from their remote progeny, it is clear that our analysis as thus far conducted leaves us still confronted with the question: How did these differences arise?

We have agreed that consanguineous marriages and Mendelian inheritance explain the varying *distribution* of divergent traits among members of a fraternity, and among different fraternities of a species.

But the laws of inheritance leave quite unanswered the question as to how the traits that are

thus distributed came in the first instance to *be* divergent.

In the nature of the case, no organism can transmit anything that it does not possess either as a patent factor or a latent one submerged in its germ-plasm. Yet the present-day representatives of any species of organism confessedly have many marked and conspicuous characteristics that were not possessed by the very remote ancestors of that species. It is almost axiomatic to say this, when we reflect that, to cite the extreme instance, man himself is believed to have descended from a primordial single-celled organism.

When we view the matter in this light, we are forced to conclude that in one way or another, sometime, somewhere, new qualities have been added to the evolving organism; and that these qualities have in due course taken their place as heritable qualities, represented by hereditary factors that aforetime had no existence.

And avoiding for the moment all controversy as to just how these new traits have been acquired, the conclusion is inevitable that if we are to accept an evolutionary origin for higher organisms, we cannot escape the conviction that the new characters are heritable. There can be no question that an individual organism today receives in the sum total of its inherited tendencies a goodly num-

ber that cannot have been present in the germplasm of its ancestors of remote generations. To deny this is to deny evolution itself.

It would be a misuse of language to suggest that these new traits have originated through heredity. On the other hand, it is scarcely more than the iteration of a truism to say that they must have originated through the influence of environment.

And however far we carry the analysis we simply accentuate the same story. Time was, in the far past, when the qualities that we now term fundamental, because they are of long standing, were in their turn developing; and we are unable to suggest any way in which they could conceivably have developed except through the influence of environmental forces acting on a responsive organism.

In this view, the most that can be said for heredity is that it has held a kind of receptacle into which tendencies as they were developed were thrown for safe keeping. It has developed nothing, originated nothing; but it has been a most faithful Lord High Keeper of the Treasury, for it has let no single precious tendency escape when once it had been acquired.

The Interplay of Heredity and Environment

The function of heredity, then, is the retention

and transmission of tendencies.

This function it performs with the most absolute impartiality. It sees to it that each quality of an individual—whether dominant or subordinate, patent or latent—is represented in the progeny (considered as a whole) of that individual. It can do no more; its mission is completed for that generation; it must leave the plastic material for the great moulder, environment.

And the forces of environment come to the attack right vigorously. But they also have their limitations. Certain general characteristics of body and mind have been so ingrained in the race through persistent repetition that they can by no possibility be greatly altered in a single generation. All the tendencies of all the ancestors near and remote coincide in the direction of these qualities. The transforming power of environment must turn chiefly to those newer tendencies which have been developed in recent generations, and to a decision between antagonistic tendencies.

And yet even the primordial tendencies are not altogether beyond the pale of environment, because none of them is absolutely fixed by heredity.

Take the matter of stature, for example. The ancestral tendencies vary within a limit of many inches. Some ancestors have been perhaps but

four feet tall; others have been nearer seven feet. But there is a strong average tendency perhaps towards a stature of between five and one-half and six feet. Within these limits, environment may under ordinary circumstances decide. Nutritional conditions during infancy, childhood, and adolescence—the presence or absence of disease at critical periods, and the like—will determine the exact stature in the individual case, just as general nutritional conditions have determined the average stature of different races of men—the Esquimos, for example, or the Patagonians.

And what is true of the physical stature is equally true, *mutatis mutandis,* of the mental and moral stature. But the fact that the stature, physical, mental and moral, is fixed at a certain limit for one individual, does not irrevocably fix the limit for the offspring of that individual. Each individual case changes the average tendencies, of course, but it does not eliminate the old tendencies; and these old tendencies, reacting to a changed environment, may perhaps produce a very different individual result in a succeeding generation.

The average results, in deviation from the old average, only assume permanence when the race is subjected generation after generation to the conditions that first wrought an individual change.

The Esquimos, for example, have come to be a race of relative dwarfs because their environment has for generations been defective from a nutritional standpoint. But no doubt atavism still holds for them the tendency of remote ancestors to larger stature, and under changed climatic conditions they would doubtless return gradually to the old-time average—just as did the Monterey pine.

But even under conditions as they exist, environment has not changed the physical, mental, or moral qualities of this race in *kind,* but only in degree. The broad synoptical outline of qualities inherited from the remote common ancestry are still the same as those of every other race of human beings in the world. It is the specific, the newer, and hence, on the whole, the less essential qualities that differ.

If this is true of differences of man, it must be far more tangibly true of the extremes of the same race, who live under conditions much less widely variable than those that separate the races. Caucasian and Esquimo must perhaps go back millennia to find a common ancestor; but the lord of the manor and his lowliest servant have probably had common ancestors within a few centuries past. Not merely their fundamental tendencies then, but many of the more specialized tendencies are in-

herently the same in both. The familiar traditional tales, doubtless some of them founded on fact, of infants of beggars and princes being transposed in the cradle without subsequent discovery illustrate this fact perhaps as forcibly as a more sober argument could do.

The Brotherhood of Man

If further proof were needed, one has but to turn to the records of common every-day experience, and analyze the characteristics of such representatives of the extremes of contemporary society as are personally known to him. He will find the same general physical qualities at each end of the social scale.

Why?

Because these general qualities have had the stamp of approval of myriads of common ancestors. The details of specialization differ widely, of course; as widely in mental and moral directions, as, for example, the unkempt beard and ragged clothes of one differ from the waxed moustache and fashionable suit of the other. Such differences have been wrought by different recent environing conditions, but far more significant likenesses have been retained. The lovers of Mary Ann settled their rival claims by resort to fisticuffs; the lovers of Priscilla by innuendo, or repartee, but the principle is the same. The hero of

the Bowery stage overcomes the villain perhaps by blows, at least by physical prowess; the Broadway hero triumphs through more subtle and intellectual processes.

But the essential thing is that in each case the hero must triumph.

Why?

Because we look to stage and story for ideals, and the same ideal aspirations have been inherited from remote common ancestors by both extremes of our social life.

The fact, then, is everywhere patent that heredity accounts for the sameness of our race, not for the differences. The latter are the work of environment. Through environment, primarily, the changes are wrought; through heredity—especially as exemplified in atavism—the stability of the race is maintained.

These two forces are respectively the Radicals and the Conservatives of Nature. One insures progress, the other prevents evolution from taking such strides as would lead the races to disaster. The practical eugenist must study both with equal assiduity. How largely he must depend upon environment to direct the forces of heredity will be illustrated at length in another monograph of this series.

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